must therefore be coupled with agricultural policies and actions that extend far beyond finance. When the preconditions of capital investment are met, spectacular increases in productivity can follow as the Bank itself has witnessed."

Limitations on investment in agriculture, therefore, are not simply those imposed by the scarcity of capital in most underdeveloped countries. Brown points out that, in subsistence economies, agriculture is not "market oriented." Relatively little food is available for marketing, and as a result cash incomes are low and farmers don't acquire the capital needed to purchase the inputs which result in higher yields.

Furthermore, prices for farm commodities in underdeveloped nations are generally unfavorable with respect to the price of inputs needed to raise yields—fertilizers and pesticides, for example. It is estimated that 1 pound of rice in Japan will buy as much ammonium sulfate as 3 pounds of rice in India.

Breaking the vicious circle requires not only reform of the landholding, credit, and commodity pricing systems in underdeveloped nations but also transformation of the society which has generated these systems. Increasing the food production and decreasing the rate of population growth ultimately depend on rapid changes in societies which may have been well adapted for survival a hundred or five hundred or a thousand years ago but are now producing too many people and too little food.

In the industrialized countries the present favorable balance between food production and population growth is usually attributed to industrialization, luck in the possession of raw materials, urbanization, growing literacy, and a rising standard of living. There now seems little cause for optimism that the underdeveloped countries will somehow naturally follow the same path.

After the war, what was possible was mistakenly taken as probable. Hopes for the development of major alternative sources of food, for example, have proved exaggerated or at least premature. Food from the sea, predominantly fish, still provides only about 1 percent of the food energy for man. And overfishing in the best fishing grounds has already become a serious problem. Production of fish flour from species not now commercially sought after provides one new potentially important source of protein, but other schemes, such as those for converting plankton and seaweed into major food resources, have made little progress.

Food can be synthesized from such raw materials as petroleum, but the problems of making it both economic and palatable have not been solved.

The best immediate prospects seem to lie in the expansion of arable lands through irrigation made possible by conversion of sea water and brackish water in nuclear-powered desalinization plants. In parts of Asia, Australia, the Middle East, and North Africa the desert could probably be made to bloom.

But even this will take time and money, and a good deal of both. Meanwhile the United States, with its food-producing potential, its agricultural know-how, and its money, is inevitably type cast as a combination benefactor and banker to the underdeveloped countries, the noncommunist ones at least.

In the last few years a realization of what the consequences of this involvement may be has been growing in Washington. As a result, President Johnson early in the year announced that, henceforth, recipients of Food for Peace shipments would be expected to carry out effective self-help measures (*Science*, 6 May). This, in short, means effective measures to control the rate of population growth and to modernize agriculture at a faster rate. What happens if a country doesn't help itself and then asks us for food to stave off a devastating famine is a question which suggests the sort of moral and political dilemma that will confront the United States if, as now seems certain, the world population curve continues to rise faster than the food production curve.

—JOHN WALSH

Announcements

Three institutions in Texas have joined in a cooperative program for research to help meet the state's needs for **water resources**. The University of Texas, Texas A&M University, and Texas Technological College signed an agreement in March to coordinate their efforts in long-range research and academic projects. The agreement makes the Water Resources Research Institute in Texas (established at Texas A&M in 1964) the agency through which state-supported universities will present proposals for research funds to federal and state agencies. A three-member Water Resources Research Program Committee representing the institutions will formulate programs and priorities for funding requests, keep track of research and education in the state, and recommend means of coordinating programs and exchanging information. The group will also appoint a panel of at least a dozen members, to advise on "matters that are in the public interest concerning the role and scope of water resources research in Texas."

The newest AEC exhibit, **Life Science Radiation Laboratory**, was put on display last month at the Smithsonian Institution in Washington, where it will remain through July. A "working lab" designed by Oak Ridge Associated Universities for extended showings in major cities, it uses live plants and animals, as well as inorganic materials, to illustrate the beneficial uses of radiation in medicine, agriculture, and biology. Lecture-demonstration programs lasting 20 to 30 minutes are presented by personnel trained at Oak Ridge.

Scientists from academic, governmental, industrial, and military organizations are invited to contribute planning advice for the expansion of the Joint Oceanographic Institutions **Deep Earth Sampling** (JOIDES) program. The program is being carried out by the Institute of Marine Science, Lamont Geological Observatory, Scripps Institution of Oceanography, and Woods Hole Oceanographic Institution, with support from the National Science Foundation. JOIDES has completed a "modest drilling project" on the Blake Plateau (*Science*, 5 Nov. 1965, p. 709), and is now planning a broader program, expected to begin next year, during which there will be opportunities for scientists to participate in the drilling and research operations. Drilling in both the Atlantic and Pacific Oceans will be at depths to 6000 meters, and may penetrate as much as 1000 meters into the ocean floor. Resulting materials and data will be available to scientists regardless of their affiliations, provided that the results of their research are published promptly. Sugges-

tions and expressions of interest should be sent to J. H. Stanbrough, Jr., executive secretary of JOIDES, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts.

Courses

Wayne State University will present an institute in **experimental stress analysis** 12–23 September in Detroit. Two separate programs will be offered: strain gage theory and application the first week, and photoelasticity and Moiré methods the second week. Applicants may enroll in either program for a $200 registration fee or in both, for $375. The fees include necessary equipment. (Joseph Der Hovanesian, Department of Engineering Mechanics, Wayne State University, Detroit, Michigan 48202)

Engineering aspects of the ocean environment will be the subject of a course presented at MIT 18–29 July. The program will deal with the major physical, chemical, and circulatory characteristics of the deep oceans and continental shelves, and with their relations to the operation of underwater vehicles and equipment. The first part of the course will discuss the world ocean as a hydrodynamic and thermodynamic fluid system, emphasizing present deficiencies in our understanding of it. The remainder of the program will be concerned with environmental characteristics which bear on engineering activities for study and exploitation of the ocean. The course fee is $350. (James M. Austin, Room E19-356, MIT, Cambridge, Massachusetts 02139)

A course on **genetics and physiology of bacteriophage** will be presented 28 August to 23 September at the International Laboratory of Genetics and Biophysics, Naples, Italy. The program will include seminars and laboratory work designed to illustrate the properties of bacteriophage and the quantitative experimental methods used in the field. Participation will be limited to 16 postgraduate students in mathematics, physics, chemistry, or biology. Six fellowships, sponsored by UNESCO, will cover travel and living expenses; the laboratory will provide 10 fellowships covering living expenses only. Language: English; application deadline: *15 June*. (International Laboratory of Genetics and Biophysics, Naples, Italy)

Stanford University will present a workshop in advanced **chemical kinetics** 25 July to 5 August. The course will include lectures and discussion on the applications of modern techniques of kinetic analysis; emphasis will be on the ways to best estimate rate parameters and thermochemical data. Applicants must have a bachelor's degree in one of the physical sciences or in mathematics, plus the equivalent of a year of physical chemistry. Attendance will be limited to 40. Costs for the course include: registration, $350; books, no more than $20; room on campus, $5 a day; food, $7 a day. (Kinetics Workshop, Department of Chemical Engineering, Stanford University, Stanford, California)

The following courses will be offered at the Polytechnic Institute of Brooklyn. Additional information is available from Doris Cattell, Special Courses, Polytechnic Institute of Brooklyn, Brooklyn, N.Y. 11201.

The course on **x-ray diffraction** is scheduled for 6–17 June. Participants need have no prior experience in the field, but those who have done work in x-ray diffraction may arrange for advanced study. Instruction will be offered in the use of optical methods for the computation of Fourier series and of x-ray intensities, and in the use of the polarizing microscope. Attendance is limited to 25, and the fee is $300.

The course on fundamentals of **polymer chemistry**, 27 June to 1 July, will emphasize synthetic and physical aspects. Sessions will be included on radial, ionic, stereoregular and ring-opening polymerization, viscometry, osmometry, light scattering, infrared, nuclear magnetic resonance, and mechanical behavior of polymers. Attendance limit, 40; fee, $250.

Northeastern University will sponsor a workshop in **electron microscopy for the biological sciences** 19 June to 1 July in Weston, Massachusetts. Participation will be limited to 12. Emphasis of the course will be on laboratory techniques and specimen preparation. Supervised instruction will be scheduled from 9 a.m. to 10 p.m., and the laboratories will be open 24 hours a day. Tuition is $600. (Clifford Youse, Center for Continuing Education, Northeastern University, 360 Huntington Avenue, Boston, Massachusetts 02115)

A course on the principles and application of ultraviolet, infrared, nuclear magnetic resonance **spectroscopy and mass spectrometry** leading to the determination of molecular structure will be offered 27 June to 1 July at Fairleigh Dickinson University. A fee of $190 will cover tuition, room and board, and materials for the workshop. (R. A. Baylouni, Chemistry Department, Fairleigh Dickinson University, Madicon, New Jersey)

A refresher course in **measurement engineering** will be held 25–29 July at Hobart and William Smith Colleges, Geneva, New York. The program will be oriented toward applications of measurement systems and will not cover primary standards or precision calibration techniques. Registration will be limited; applicants should have a bachelor's or higher degree and should be working in theoretical, application, or administrative positions in industry, government, or educational institutions. A $275 registration fee will cover tuition, text and materials, room and board. Deadline: *14 July*. (Karl B. Schnelle, Jr., Instrument Society of America, 530 William Penn Place, Pittsburgh, Pennsylvania 15219)

The laboratory branch of the PHS Communicable Disease Center has announced its schedule of short courses in subdivisions of **microbiology.** The courses vary in length from 3 days to 4 weeks and will be presented between 1 August and 30 June. Applications and additional information are available from the Training Office, Laboratory Branch, Communicable Disease Center, Atlanta, Georgia 30333.

The Armed Forces Institute of Pathology, Washington, will offer a course on the **pathology of laboratory animals** 19–23 September. The program is open to civilian and military personnel responsible for recognition and interpretation of lesions in animals. Besides pathology, the course will include discussion of the etiology, diagnosis, and control of the diseases of laboratory animals. There will be no fee for the course. Application deadline: *1 August*. (J. M. Blumberg, Director, Armed Forces Institute of Pathology, Washington, D.C. 20303)

A course on **pattern recognition** will be presented 5–15 July at MIT. The first week will be devoted to the bio-

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logical phenomena of pattern recognition, including physiological studies of the crab, frog, cat, and monkey; psychophysics of pattern perception in humans; and human perceptual and conceptual processes in vision and hearing. The second week will emphasize abstract processes, such as computer simulation, character recognition by machine, and mathematical representations. Tuition: $350; partial scholarships available for faculty members from other institutions. (Director of the Summer Session, Room E19-356, MIT, Cambridge, Massachusetts 02139)

Grants, Fellowships, and Awards

Grants-in-aid for research in **agricultural chemistry** are being offered by the Herman Frasch Foundation. The grants, for work to begin in July 1967, will provide $5000 to $10,000 a year for up to 5 years. Applicants should be nonprofit, incorporated institutions which are performing research "of possible benefit to agricultural development in the U.S." Application deadline: *1 August.* (Earl A. Samson, Jr., U.S. Trust Company of New York, 45 Wall Street, New York 10005)

The International Union Against Cancer is accepting applications for research fellowships to begin next March. The Eleanor Roosevelt International **Cancer Fellowships**, funded by the American Cancer Society, will be granted to experienced investigators on the staff of a university, teaching hospital, research laboratory, or similar institution, who wish to study for a year at a foreign institution. Fellowships will not be given to those who want to perfect their training in methods of cancer detection or in therapeutic techniques or who wish to visit several institutions for brief periods. Stipends will be based on the recipients' current salaries and comparable salaries at the host institutions. Allowances will also be made for travel for the recipients and their dependents. *Deadline: 1 September.* (International Union Against Cancer, P.O. Box 400, Ch-1211, Geneva 2, Switzerland)

The University of Tennessee has established a postgraduate training program for **science librarians**, supported by the National Library of Medicine. Participants will, in addition to their

course requirements, be assigned to research teams for which they will act as research librarians. Applicants for the program must hold an M.S. degree in library science; preference will be given those who also have a degree in one of the physical or biological sciences. Appointments are for 1 year and may be renewed for up to 3 years. Annual stipends will be $5500, plus $500 for each dependent and a 5 percent annual increment. The program is to begin 1 July, although appointees need not start their training at that time. (Andrew Lasslo, Department of Pharmaceutical and Medicinal Chemistry, University of Tennessee College of Pharmacy, Memphis, 38103)

Summer Institutes

Non-Linear Effects in Plasmas, 5–23 September, Faculté des Sciences d'Orsay, University of Paris; organized by Joint Institute for Laboratory Astrophysics, sponsored by NATO; for graduate students and research workers; participation, free of charge, attendance limited. Some travel grants available for U.S. citizens. (G. Kalman, JILA, University of Colorado, Boulder)

Thermoanalysis, 5th annual, 13–22 June, Fairleigh Dickinson University. First session, principles and applications, 13–17 June; background and laboratory demonstrations of techniques; fee: $125, $65 dormitory facilities. Second session, recent advances, 20–22 June; for those familiar with the field; fee: $75, $40, dormitory facilities. (Saul Gordon, Fairleigh Dickinson University, Madison, New Jersey)

Meeting Notes

"**Marine geodesy**, present and future" will be the theme of an international symposium 28–30 September in Columbus, Ohio. Marine geodesy involves, basically, the establishment at sea of horizontal and vertical control for hydrographic, bathymetric, and geophysical surveys and navigation. The symposium's technical sessions will deal with definition of marine geodesy, its challenges and opportunities, including law at sea; requirements for geodetic controls and networks for exploration mapping, charting, and navigation; methodology and technology for marine geodesy and application of under-

water acoustic and long-distance measurements over ocean stations; and applications of marine geodesy and its role in development and exploration of the world's oceans. Sponsors: U.S. Coast and Geodetic Survey and Columbus Laboratories, Battelle Memorial Institute. (A. G. Mourad, Columbus Laboratories, Battelle Memorial Institute, Columbus, Ohio 43201)

A symposium on **origin and distribution of the elements** will take place in Paris 21–23 September. Papers are invited for presentation at any one of the meeting's five sections: theories of origin; solar, stellar, and interstellar abundances; meteorites; planets, asteroids, comets, tektites; and terrestrial abundances. The proceedings are to be published, and manuscripts are also solicited for publication whether or not the papers can be presented during the Paris meeting. Sponsors: International Association of Geochemistry and Cosmochemistry, International Union of Geological Sciences; and UNESCO. (Earl Ingerson, Department of Geology, University of Texas, Austin 78712)

The 51st national conference on **weights and measures** is scheduled for 11–15 July in Denver, Colorado. The meeting covers both weights and measures laws and regulations and the technology of weighing and measuring. It is meant as a meeting ground for all levels of government concerned with weights and measures administration, for industries associated with weighing and measuring equipment and packaging, and for industries which offer their products for sale in weighed and measured quantities. Registration fee: $15. Sponsor: National Bureau of Standards. (Executive Secretary of the Conference, NBS, Washington, D.C. 20234)

Scientists in the News

Vernon Knight, clinical director of the National Institute of Allergy and Infectious Diseases, has been named professor and chairman of the microbiology department at Baylor University and head of the division of infectious diseases, effective 1 July.

Howard Gest, professor of microbiology at Washington University, will join the faculty at Indiana University 1 July as chairman of the department of microbiology. The department, formerly the department of bacteriology, has been headed by **Leland S. McClung**, who was recently appointed assistant director in the division of biological sciences.

A. Donald Misener will succeed **George B. Langford** as director of the University of Toronto's Great Lakes Institute, effective 1 July. Misener is now associate director of the institute and professor of physics at the university.

John M. Ward, chairman of the biology department at Temple University, has been appointed dean of science at Oregon State University, as of 15 July.

Leo Goldberg, professor of astronomy at Harvard, has succeeded **Donald H. Menzel** as director of the Harvard College Observatory. Menzel, who had led the observatory since 1952, has retired to devote full time to teaching and research at the university.

Richard B. Woodbury has been appointed to a 1-year term as chairman of the office of anthropology at the Smithsonian Institution. He has been with the Smithsonian since 1963.

Donald C. Goodman, anatomy and neurology professor at the University of Florida, has been named chairman of the university's anatomy department.

The following were recently elected Fellows of the Royal Society:

Alan Rushton Battersby, professor of organic chemistry, University of Liverpool

Thomas Benjamin Brooke, assistant director of research, department of engineering and department of applied mathematics and theoretical physics, University of Cambridge

K. G. Budden, lecturer in physics, Cavendish Laboratory, University of Cambridge

R. E. Davies, professor of biochemistry and chairman, department of animal biology, University of Pennsylvania

W. R. S. Doll, director of the statistical research unit, Medical Research Council and lecturer in medical statistics and epidemiology, University of London

S. F. Edwards, professor of theoretical physics, University of Manchester

J. S. Forrest, director, Central Electricity Research Laboratories, Leatherhead, Surrey

F. C. Fraser, keeper of zoology and

deputy chief scientific officer of the British Museum of Natural History, London

Harry Harris, professor of human genetics and director of the Galton Laboratory, University of London

D. O. Hebb, professor of experimental psychology, McGill University

William K. Hutchison, deputy chairman, Gas Council, London

Alick Isaacs, member of the scientific staff, National Institute for Medical Research, London

Basil Kassanis, senior principal scientific officer, department of plant pathology, Rothamsted Experimental Station, Harpendon, Herts.

R. A. Kekwick, reader in chemical biophysics and head of the department, Lister Institute of Preventive Medicine, University of London

P. E. Kent, chief geologist, British Petroleum Company, London

D. G. King-Hele, senior principal scientific officer, Royal Aircraft Establishment, Farnborough, Hants

Francis G. W. Knowles, reader in comparative endocrinology, University of Birmingham

Georg Kreisel, professor of Mathematics, University of Paris at the Sorbonne

C. E. Lucas, director of fisheries research, Department of Agriculture and Fisheries for Scotland and director of the Marine Laboratory, Aberdeen

James D. McGee, professor of applied physics, Imperial College, University of London

J. W. Menter, director of research and development, Tube Investments, Ltd., Hinxton, Cambridge

A. E. Mourant, director of the Medical Research Council's Serological Population Genetics Unit, St. Bartholomew's Hospital, London

E. S. Pearson, emeritus professor of statistics, University College, University of London

D. H. Perkins, professor of elementary and particle physics, Nuclear Physics Laboratory, University of Oxford

L. M. Pickford, reader in physiology, University of Edinburgh

H. O. Schild, professor of pharmacology, University College, University of London

H. M. Stanley, director and controller of the research and development division, The Distillers Co., London

B. A. D. Stocker, professor of Medical Microbiology, Stanford University

J. Sutton, professor of geology and head of the department, Imperial Col-

lege of Science and Technology, University of London

M. Szwarc, research professor and director of polymer research, State University of New York College of Forestry, Syracuse

D. H. Whiffen, deputy chief scientific officer, Basic Physics Division, National Physics Laboratory, Teddington, Middlesex

Frederick White, chairman of the Commonwealth Scientific and Industrial Research Organization, Canberra, Australia.

Recent Deaths

Milislav Demerec, 71; senior geneticist at Brookhaven National Laboratory, and one of the discoverers of mutable genes; 12 April.

Rufus H. Fitzgerald, 75; chancellor of the University of Pittsburgh from 1944 to 1955; 11 April.

Jackson Walter Foster, 51; professor of microbiology, University of Texas; 9 April.

Elizabeth O. King, research microbiologist in charge of the Diagnostic Bacteriology Laboratory, PHS Communicable Disease Center, Atlanta, Georgia; 8 April.

Harry Houser Love, 86; professor emeritus and former head of the department of plant breeding, Cornell University; 20 April.

Harold Hanson Mitchell, 80; professor emeritus of animal nutrition, University of Illinois; 28 March.

R. M. Petrie, 59; director of the Dominion Astrophysical Observatory, British Columbia, Canada; 8 April.

Martin Silderberg, 70; professor emeritus of pathology, Washington University; 12 April.

John Teeter, 66; former executive director of the Damon Runyon Memorial Fund for Cancer Research, and since last year executive vice president of Germfree Products, Inc., St. Petersburg, Florida; 12 April.

Anna Pell Wheeler, 82; professor emeritus of mathematics at Bryn Mawr College; 26 March.

John H. Williams, 57; professor of physics, University of Minnesota and president, Argonne Universities Association; 18 April.

Erratum: In the report "Oxygen isotope fractionation in the system dolomite-calcite-carbon dioxide" by J. R. O'Neil and S. Epstein (8 April, p. 198), the last part of the first sentence should have read ". . . the oxygen isotopic compositions of each mineral of a pair are essentially the same (over a 7 per mil range)."